

CHAPTER 1 EXECUTIVE SUMMARY

1.1 Between December 17, 2012 and February 19, 2013 Parsons Government Services (Parsons) and its subcontractors performed Resource Conservation Recovery Act (RCRA) facility investigation (RFI) field activities at the former Permitted Open Burning/Open Detonation (OB/OD) Areas within Red River Army Depot (RRAD), Bowie County, Texas, in general accordance with the approved work plan (Parsons, 2012f). This RFI report describes the investigation conducted at the former Permitted OB/OD Areas.

1.2 The purpose of the RFI was to characterize the nature and extent of munitions and explosives of concern (MEC) and munitions constituents (MC) contamination present. Results of the RFI evaluate the nature and extent of potential hazards associated with MEC and potential risks associated with MC contamination at the three areas.

1.3 To characterize MEC at the former Permitted OB/OD Areas, analog surveys were performed in standardized grids throughout the three areas and subsequent intrusive investigation were performed of selected anomalies within those grids. In addition, an investigation was performed at the potential locations of trenches at OB Area 1 and OB Area 2, and included qualitative reconnaissance (QR) and exploratory excavations.

1.4 No MEC items were found during the RFI, although numerous items of munitions debris (MD) were recovered, which indicates the presence of MEC. The types of munitions observed were consistent with the munitions expected to be present based on historical records. Despite no MEC being found, the historical use of the site as an OB/OD Area makes it very likely that unexploded ordnance (UXO) remain at the site. In addition, two MEC items have been found in the vicinity of the former Permitted OB/OD Areas since demolition activities ceased. One BLU-91/BB Gator Anti-Tank Mine (submunition) was found approximately 25 feet south-southwest of monitor well OBOD-K. This MEC item was detonated by Fort Hood Explosive Ordnance Disposal (EOD) on August 27, 2012. A second BLU-91/BB Gator Anti-Tank Mine was found approximately 200 feet north of the OD Area, which was destroyed by Barksdale Air Force EOD on November 7, 2012. At both OB Areas, results of the RFI showed that in general, the greatest potential for vertical MEC contamination is within the shallow soil less than 24 inches below ground surface (bgs). The trench investigative work did not indicate the presence of trenches at OB Area 1 or 2. However, during the intrusive grid investigations, indications of two potential burial pits containing MD related to 40 millimeter (mm) anti-aircraft projectiles were encountered adjacent to two of the former burning pan locations at OB Area 1. Within the OD Area, results of the RFI showed that the potential for vertical contamination extended deeper than the shallow soil and was consistent with the conceptual site model (CSM) assumption that the majority of MEC would most likely be concentrated at depths of 4-5 feet bgs on average.

1.5 Results of the MEC investigation also showed that the potential for horizontal extent of MEC contamination encompassed the extent of each formerly permitted area. Based on the confirmed presence of MEC at these areas and the general level of site accessibility, the existence of potentially complete MEC exposure pathways is confirmed at the surface and in the subsurface for the areas.

1.6 Based on results of the RFI, a MEC Hazard Assessment (HA) evaluation was performed using with input data based on historical documentation, field observations, and results of this RFI and previous studies. The MEC HA evaluation calculated a total MEC HA score of 840 for the former Permitted OB/OD Areas, which equates to the maximum Hazard Level of 1. This Hazard Level indicates an area with the "highest potential explosive hazard conditions" (USEPA, 2008). While the total MEC HA scores and the associated hazard levels are to be used as qualitative references only, this information will provide the baseline for the assessment of response alternatives to be conducted in the corrective measures study (CMS).

1.7 To characterize MC at the former Permitted OB/OD Areas, the following sampling was conducted:

- Incremental samples were collected from sample units (SU) that provided coverage of the entire surface acreage of each area;
- 16 soil borings, which were focused at the known former disposal areas (e.g., containment trays, burning pans, etc.), were drilled with the resulting soil cores analyzed at various depths to capture representative soil conditions resulting from the OB/OD Area disposal activities;
- A discrete surface soil sample was collected at the top of each boring location; and
- A discretionary sample was collected in an area where stained surface soil was observed.

1.8 Incremental surface soil samples collected at each SU were analyzed for polynuclear aromatic hydrocarbons (PAH), explosives, and MC metals (for this site includes antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, and silver). Discrete surface soil samples collected from the top of each boring were analyzed for benzene, toluene, ethyl benzene, and xylenes (BTEX) (in the OB Area 1 and Area 2 samples), PAHs, and copper. One surface soil sample collected in OB Area 1 and OB Area 2 was also analyzed for dioxins and furans. One surface soil sample was collected as a discretionary sample in an area of soil staining at the OD Area and analyzed for explosives, PAHs, MC metals and perchlorate. Subsurface soil samples collected from the soil borings were analyzed for BTEX (at OB Area 1 and OB Area 2 only), PAHs, explosives, MC metals, and perchlorate.

1.9 Analyte concentrations were first compared to preliminary screening values (PSV), which included TCEQ ecological benchmarks for soil and Tier 1 residential PCLs for 30-acre sites. Any analytes exceeding PSVs were further evaluated by comparing the concentration to the critical Protective Concentration Limit (PCL) to identify chemicals of potential concern (COPC). The critical PCL was developed in accordance with Texas Risk Reduction Program (TRRP) requirements, and is the lowest of the Tier 2 human health PCL, and the Tier 2 ecological PCLs calculated for four potential ecological receptors. The results of the PSV and critical PCL comparisons are summarized in **Table 1.1**. COPCs were further evaluated in the

risk assessment to identify chemicals of concern (COC), potentially affected receptors, and pathways.

Table 1.1
Summary of Analytes Exceeding Comparison Criteria
Former Permitted OB/OD Areas RCRA Facility Investigation, Red River Army Depot,
Bowie County, Texas

Area	Affected Media	Preliminary COPCs	Analytes Exceeding PSV	Analytes Exceeding Critical PCL (COPCs)
OB Area 1	Surface Soil	PAHs Explosives MC Metals BTEX Dioxins and furans	Nitroglycerin Barium Copper Lead Mercury Silver	Mercury
	Subsurface Soil	PAHs Explosives MC Metals BTEX	Tetryl Chromium Copper Lead Mercury Selenium	Mercury
OB Area 2	Surface Soil	PAHs Explosives MC Metals BTEX Dioxins and furans	2,4-DNT Copper Lead	None
	Subsurface Soil	PAHs Explosives MC Metals BTEX	Barium Cadmium Chromium Copper Nickel Selenium	Selenium
OD Area	Surface Soil	PAHs Explosives MC Metals Perchlorate	2,4-DNT RDX Nitroglycerin Copper Mercury Selenium	Mercury
	Subsurface Soil	PAHs Explosives MC Metals BTEX	Copper Mercury Selenium Silver	Mercury

Notes: Tetryl = Methyl-2,4,6-trinitrophenylhydrazine
 2,4-DNT = 2,4-Dinitrotoluene
 RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine

1.10 Incremental samples had concentrations above the PSV for 2,4-DNT, nitroglycerin, RDX, barium, copper, lead, mercury, and silver. These analytes were compared to critical PCLs, and as a result, mercury was identified as a COPC in surface soil and retained for further evaluation in the risk assessment.

1.11 Copper was detected above the PSV in each of the discrete surface soil samples; however, the concentrations detected were below the critical PCL. In the OD Area, selenium was also detected at a concentration greater than the PSV in the discretionary sample and the associated field duplicate sample. Although the discretionary sample had detected concentrations of selenium higher than the PSV, the sample was collected within an area that was also sampled as an incremental surface soil sample unit, and the incremental sample did not identify selenium as a COPC. Incremental sampling is considered more representative of site conditions than the discretionary sample; therefore, selenium was not identified as a COPC in the surface soil within the OD Area.

1.12 Tetra, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, and silver were detected at concentrations greater than PSVs in several subsurface soil samples. These analytes were compared to critical PCLs, and as a result, mercury and selenium were identified as COPCs in subsurface soil and retained for further evaluation in the risk assessment.

1.13 COPCs evaluated further in the risk assessment included mercury in surface and subsurface soil, and selenium in subsurface soil. Based on the Tier 2 human health and ecological PCLs and the detected concentrations, it was determined that mercury and selenium are not expected to pose a risk to human receptors; however, these analytes did exceed the Tier 2 Ecological PCL within the former Permitted OB/OD Areas. The ecological receptors potentially affected are birds (via ingestion of earthworms) and burrowing mammals. Potential risks associated with MC contamination at the three areas were evaluated as part of a MC risk assessment. The risk assessment evaluated the potential for adverse effects on human and ecological receptors associated with each complete MC exposure pathway. Primary receptors in the former Permitted OB/OD Areas were anticipated to be commercial/industrial workers (e.g., forestry personnel or RRAD employees), site visitors (badged visitors or escorted visitors) and ecological receptors. The identified complete MC exposure pathway is surface soil because receptors would most likely be in contact with surface soil only — as no site activities are anticipated to include excavation to exceed a depth of 5 feet bgs. Ecological receptors that are of concern at this site are likely to only contact surface soil to a depth of 6 inches bgs. Results of the risk assessment established that an unacceptable risk to human health is not expected at the former Permitted OB/OD Areas as a result of exposure to MC in soil. However, the representative concentration of mercury in incremental samples and the maximum concentration of mercury and selenium in subsurface samples were greater than the Ecological Tier 2 PCLs. Mercury in surface soil samples, as represented by the incremental sampling results, only slightly exceeded the ecological PCL, indicating that there is no risk expected due to exposure of ecological receptors to mercury in surface soil. Although the maximum detected concentrations of mercury and selenium were greater than the Tier 2 Ecological PCL, the depth at which the chemicals occur is 60 inches bgs. The most sensitive ecological receptors for the Tier 2 Ecological PCLs were the American Robin (mercury) and the Short-Tailed Shrew (selenium). These receptors are not expected to be exposed to soils that are more than at most 20 inches bgs (Short-Tailed Shrew), and therefore mercury and selenium are not expected to pose a risk to future ecological receptors at the site.

1.14 Results of the MC sampling effort were used to delineate the horizontal extent of the MC contamination present at the former Permitted OB/OD Areas. Contamination above risk-

based levels was detected in surface soil at OB Area 1 in the southern two-thirds of OB Area 1. Contamination above risk-based levels was not detected in surface soil in the OB Area 2 or the OD Area.

1.15 Results of the MC sampling effort were also used to delineate the vertical extent of the MC contamination present at the former Permitted OB/OD Areas. Mercury was identified in subsurface soil at three soil borings within OB Area 1 (SB01, SB02, SB05) at depths of 48 to 60 inches bgs at concentrations greater than the Critical Tier 2 PCL. Therefore, based on the analytical results presented in this report, the vertical extent of MC contamination in OB Area 1 is limited to the top 60 inches of soil for mercury. Within OB Area 2, selenium was detected at a concentration greater than the Critical Tier 2 PCL in one soil boring (both the parent and field duplicate sample of SB05), at a depth of 60 inches bgs. Therefore, based on the analytical results presented in this report, the vertical extent of MC contamination in OB Area 2 is limited to the top 60 inches of soil. Within the OD Area, mercury was detected at concentrations greater than the Critical Tier 2 PCL at one soil boring location (both the parent and field duplicate sample of SB01) at a depth of 60 inches. Therefore, based on analytical results presented in this report, the vertical extent of MC contamination in the OD Area is limited to the top 60 inches of soil. These are conservative estimates and the actual depth of MC contamination is likely to be less. Even so, the vertical extent of MC contamination does not reach groundwater depth at the site, which is 180 inches bgs.

1.16 As described above, results of this RFI and the assessments of MEC hazards and MC risks summarized in the following chapters indicate that MEC contamination identified at the former Permitted OB/OD Areas poses potential explosive hazards to current and future commercial/industrial workers (e.g., forestry personnel or RRAD employees), and site visitors (badged visitors or escorted visitors) at the project site. Unacceptable risks to human receptors are not expected due to exposure to MC at the former Permitted OB/OD Areas. Mercury and selenium occur at 60 inches bgs at concentrations greater than the Tier 2 Ecological PCLs, but this depth is greater than the most sensitive ecological receptor, and therefore ecological receptors are not expected to be affected by the contaminants at this depth. There are no imminent threats to human health and the environment from releases at the former Permitted OB/OD Areas so no interim corrective measures (ICM) are recommended at this time.

1.17 The presence of MEC hazards makes the no-action alternative infeasible and it is recommended that a CMS be conducted to evaluate possible corrective measures alternatives that could be implemented to address the MEC contamination and associated explosive hazards that have been identified. The collected data and the associated characterization described in this report is considered sufficient to characterize the former Permitted OB/OD Areas, to identify and evaluate any associated potential MEC hazards or MC risks, and to support the recommended CMS. This RFI Report, including the risk assessment, and the associated CMS recommendation comply with RRAD's corrective action obligations as described in Provision XI.H.1 of RRAD's Hazardous Waste Permit No. 50178.

1.18 A general summary of the RFI results and the resulting recommendations is provided below in **Table 1.2**.

Table 1.2
Summary of Results and Recommendations
Former Permitted OB/OD Areas RCRA Facility Investigation, Red River Army Depot,
Bowie County, Texas

Site	Potential MEC Hazards?	Potential MC Risks?	Recommendation	Rationale
Former Permitted OB/OD Areas	YES Existence of potentially complete MEC exposure pathways are confirmed at the surface and in the subsurface; extent of contamination is delineated to the boundaries of the permitted OB/OD Area	NO Analytical results indicate concentrations of MC do not pose an unacceptable risk to human and ecological receptors; extent of MC greater than PSVs is delineated	Perform CMS for the former Permitted OB/OD Areas to evaluate responses to address potential MEC hazards	Potential MEC hazards are present within the area